pC polarimeter data

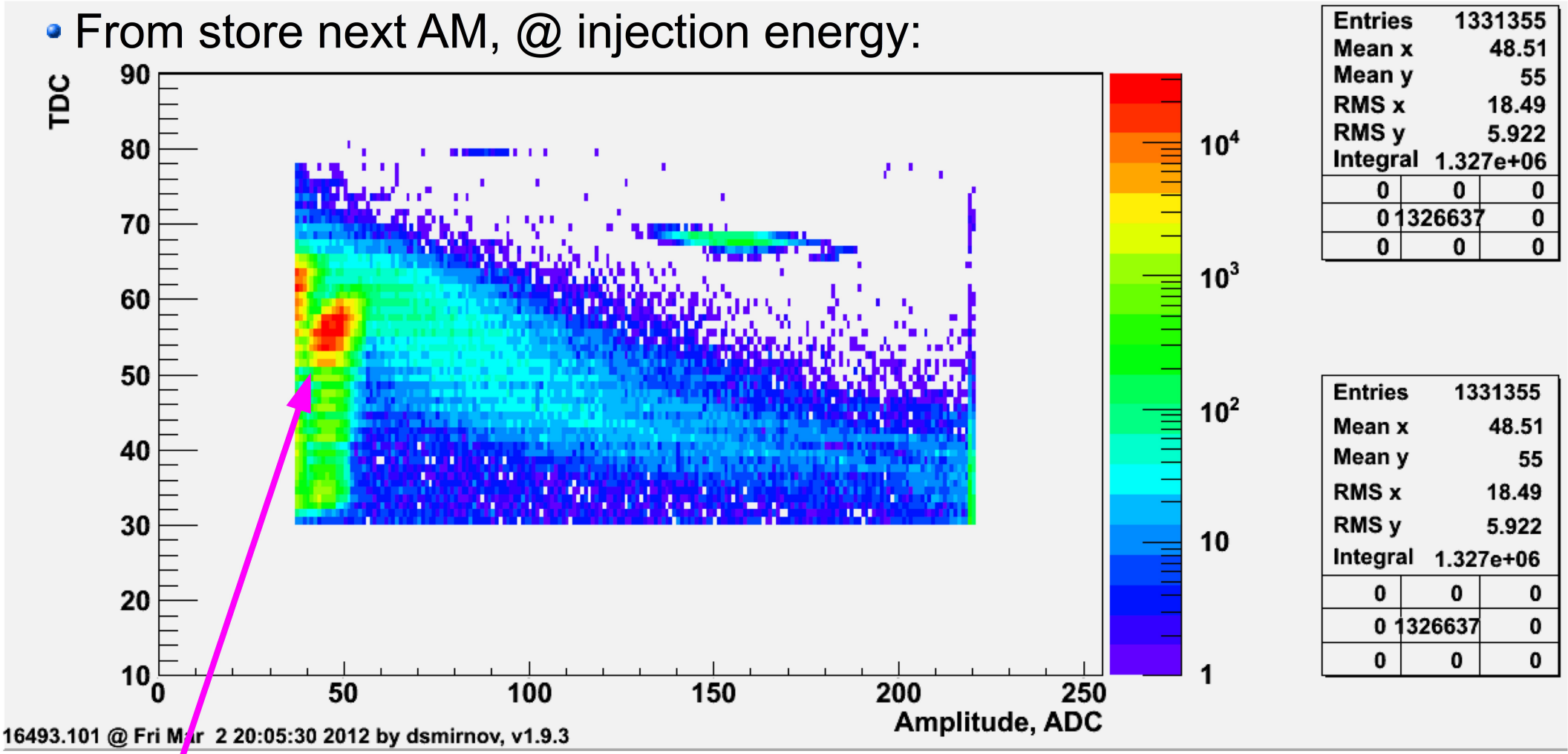
- Result from 1 chan. MUX bypass
- Brief look at waveforms (Andrei)
- Data cleaning ⇒ improving polarization measurement

Extras:

- Special target data recorded so far
- History: demise of Y2U det. 4 preamp

MUX bypass test

- Access 29.02.12 test of “MUX reflection” hypothesis:
  Y1D ch. 25 output bypassed around MUX, direct to DAQ
  Y2U ch. 25 left unconnected
- From store next AM, @ injection energy:



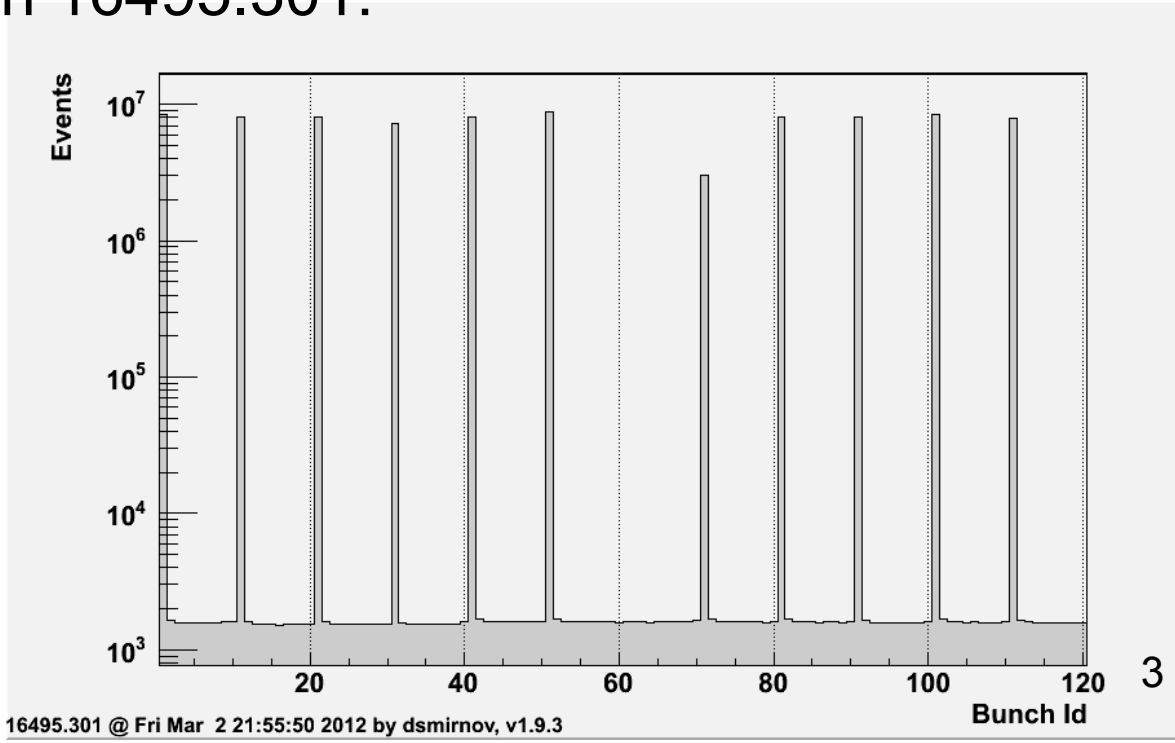
- **MUX bypass did not remedy this particular problem**

Waveform readout

Thanks to Andrei: adapted his tool for AGS→RHIC data,
and set up for me to use

- Can readout and display RAW sample data from WFDs
- Waveforms recorded for triggered events:
  max. sample > threshold, within T-window *(I think...)*
- Samples digitized every 2.4 nS (= 2 usual TDC units)

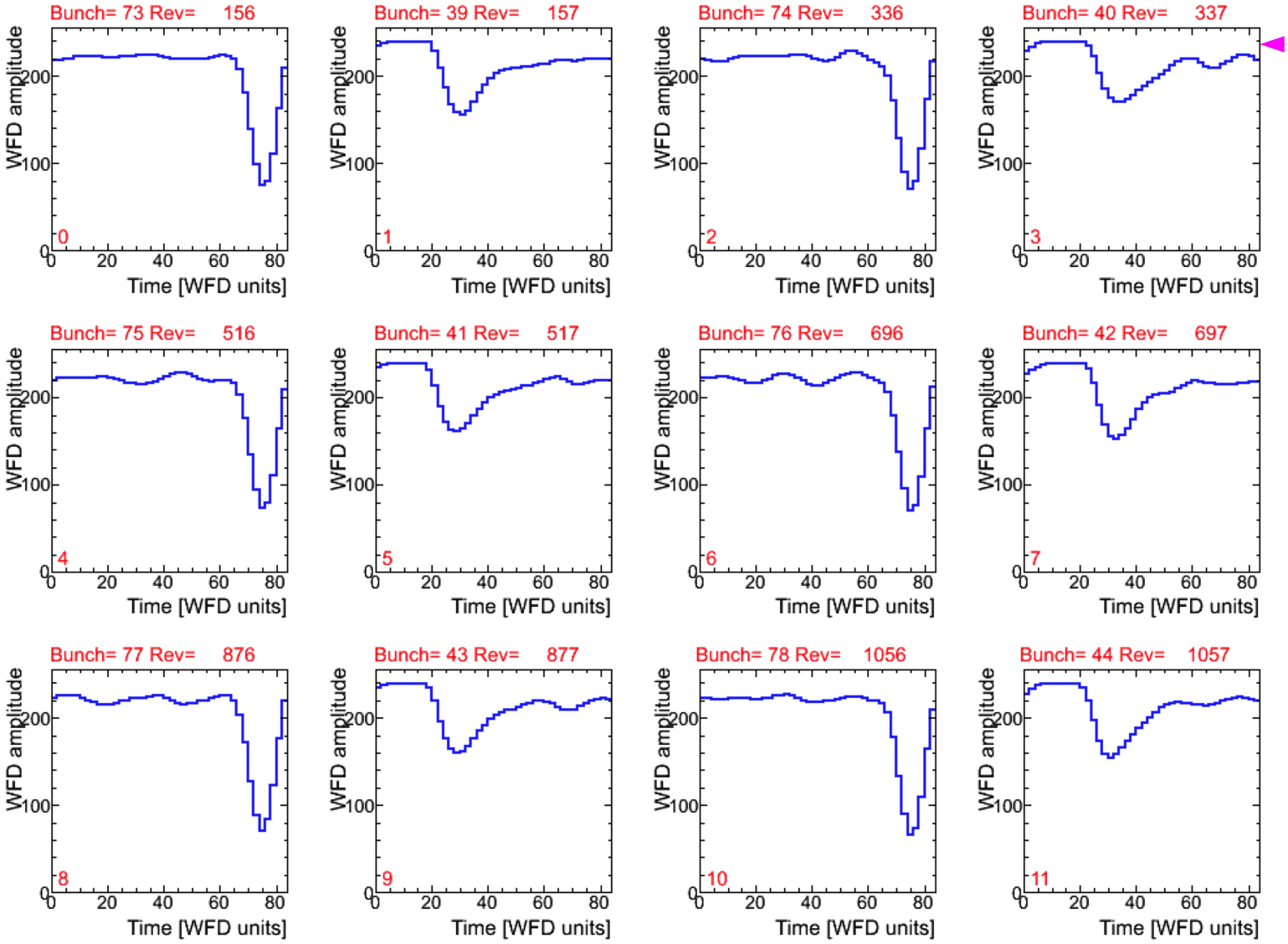
- Data taken during development period 01.03.12
- After Haixin took usual carbon sweep, I took no-target run w/ samples
- Here data from Y2U with run 16495.301:
  - 200 MHz V=20kV
  - 12 filled bunches
    equally spaced,
    except bcn-60 empty



Waveforms

- A quiet (no noise) chan. 13 (det. 2): no target, only pulser events
- Main pulse every 180 rev. + 1 bunch; 'echo' pulse 86 bunches later

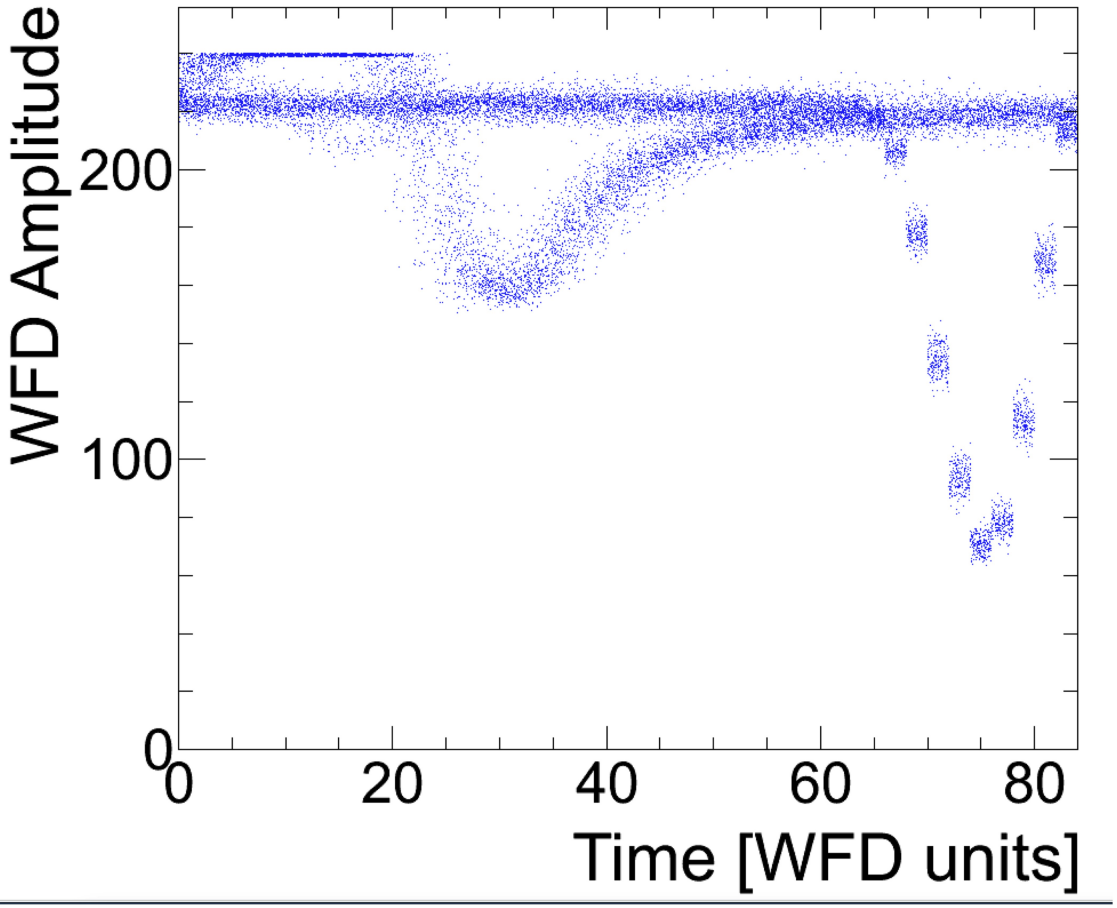
Run=16495.0 Det=1 Strip=12



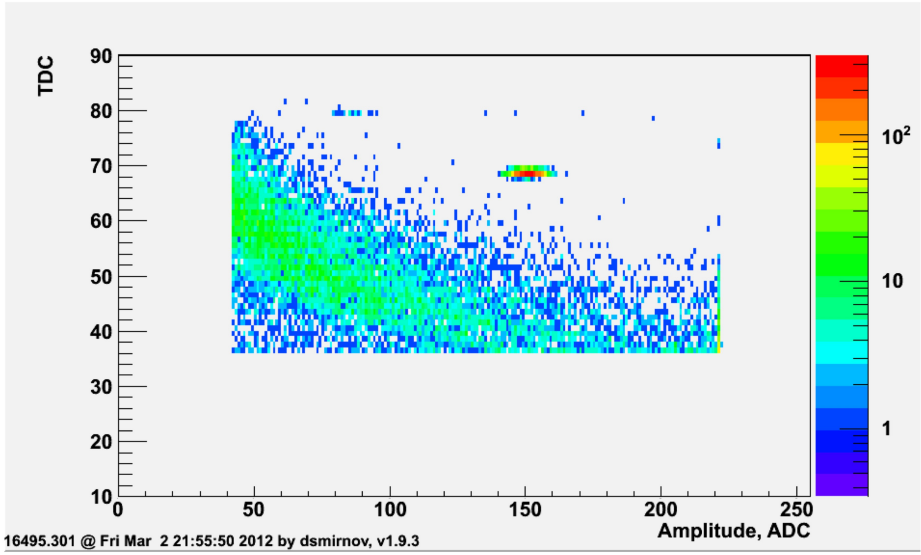
ADC counts down from baseline

Waveforms

- Ch. 13 superposition all event waveforms:



- This chan. in pC sweep run:

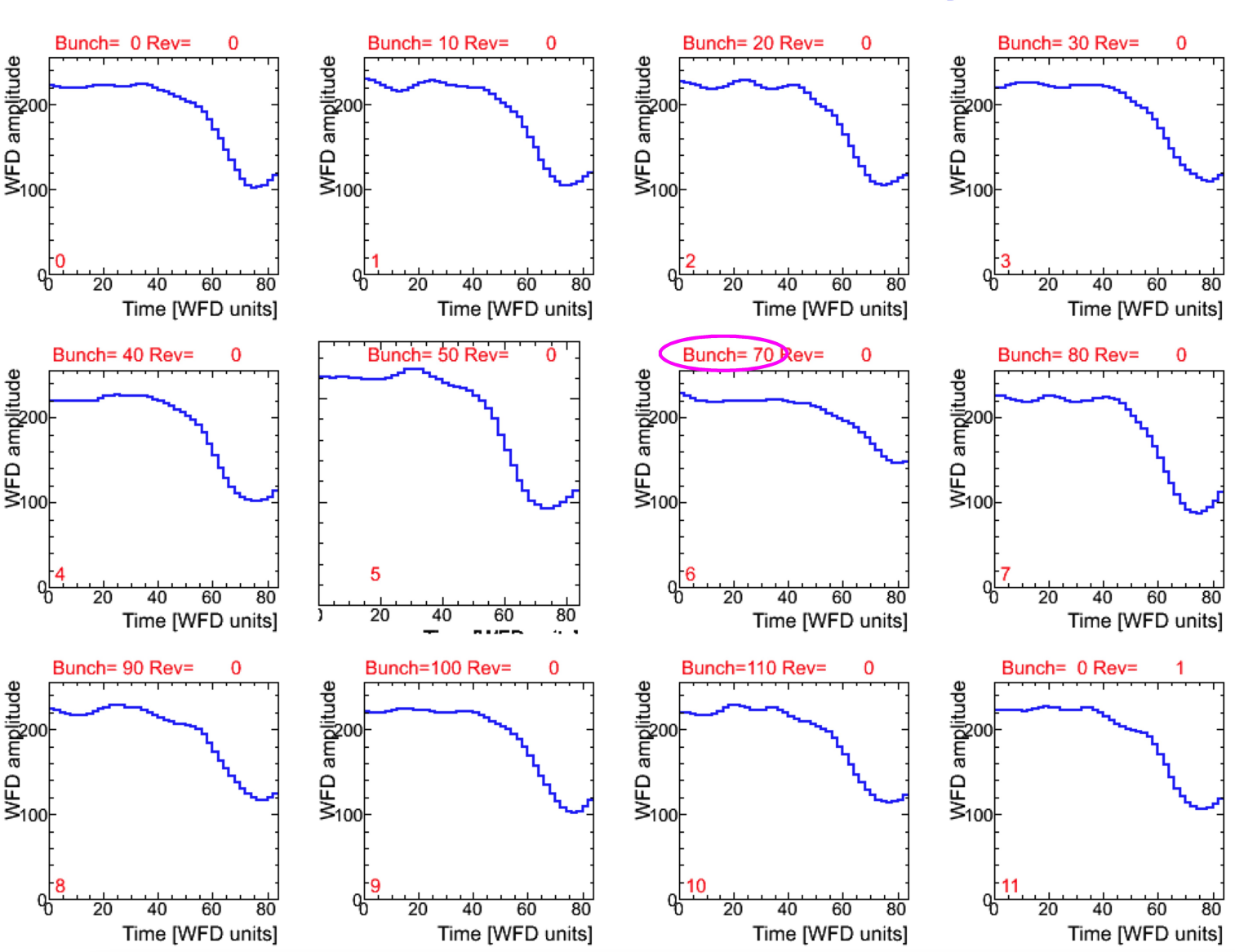


Note apparent T difference:

- Waveform peak ~75
- on banana plot T~68
- CFD: “const. frac. discrim.” extrapolate back from peak to ~1/3 max. pulse height

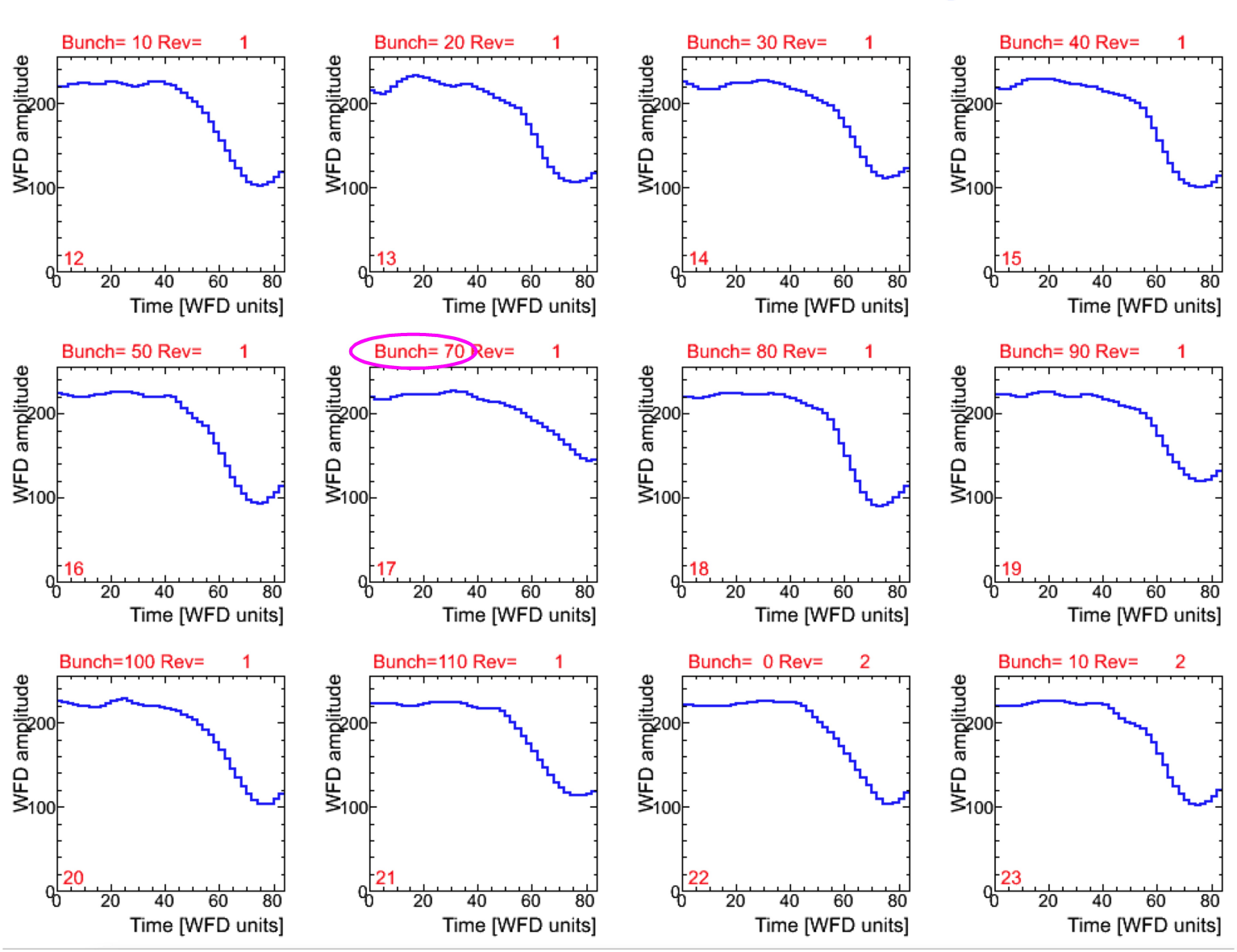
Waveforms

- Next noisy chan. 36 (det. 3): triggered every filled bunch
- Note bunch 70 (after long gap) different
- 1st 12 events:



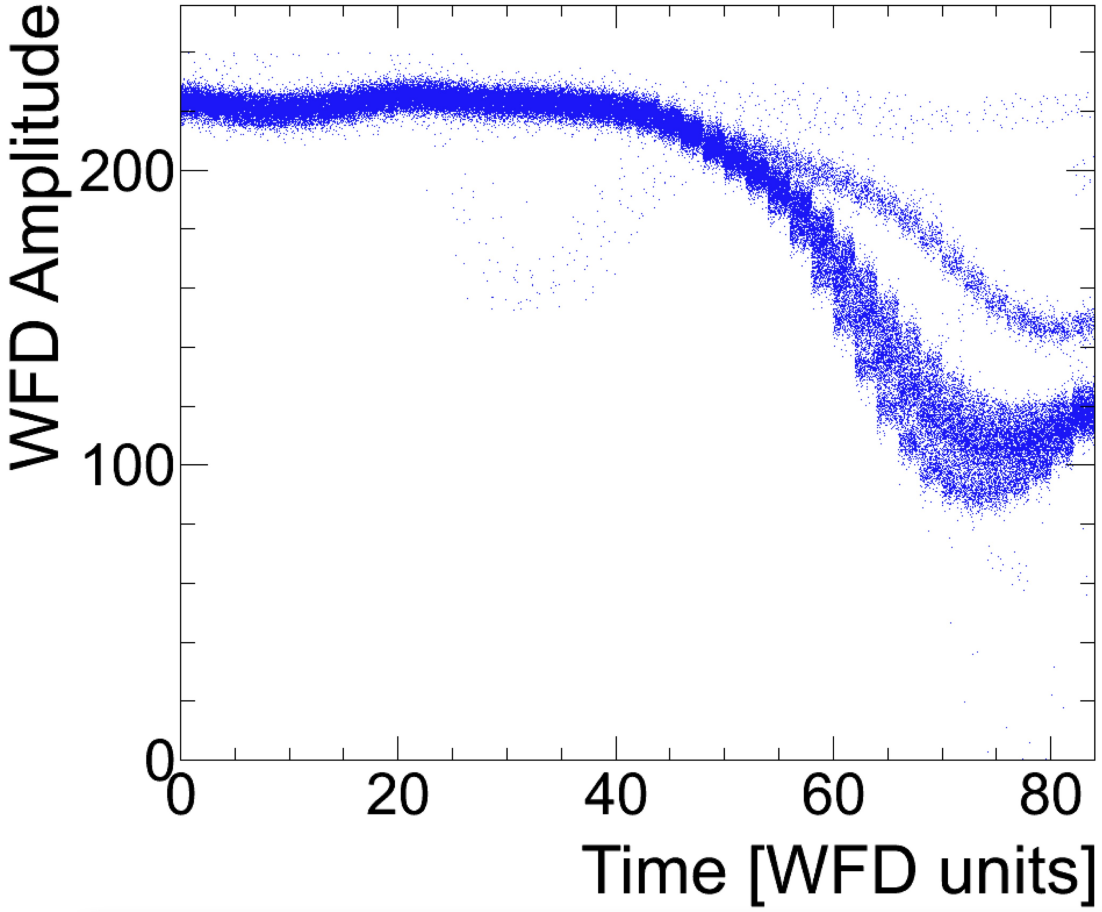
Waveforms

- Next noisy chan. 36 (det. 3): triggered every filled bunch
- Note bunch 70 (after long gap) different
- 2nd 12 events:



Waveforms

- Ch. 36 superposition all event waveforms:



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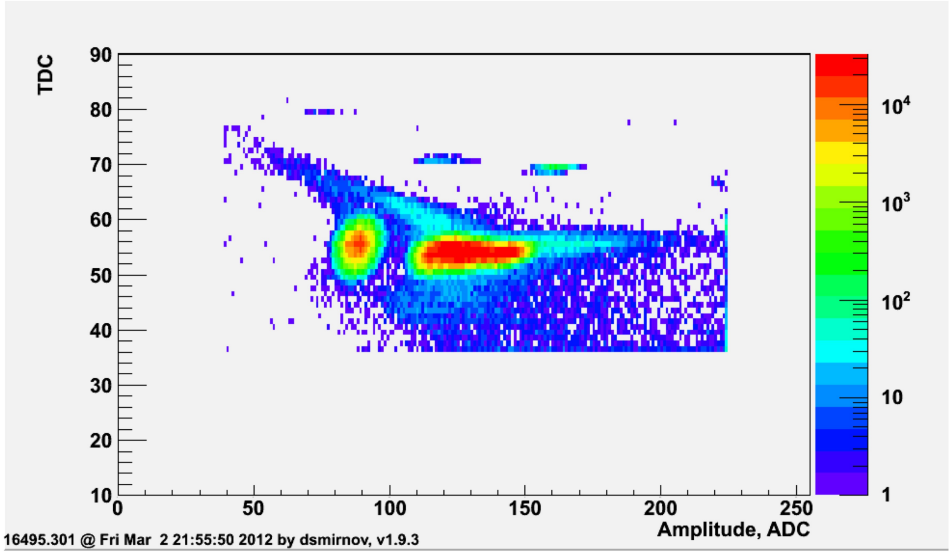
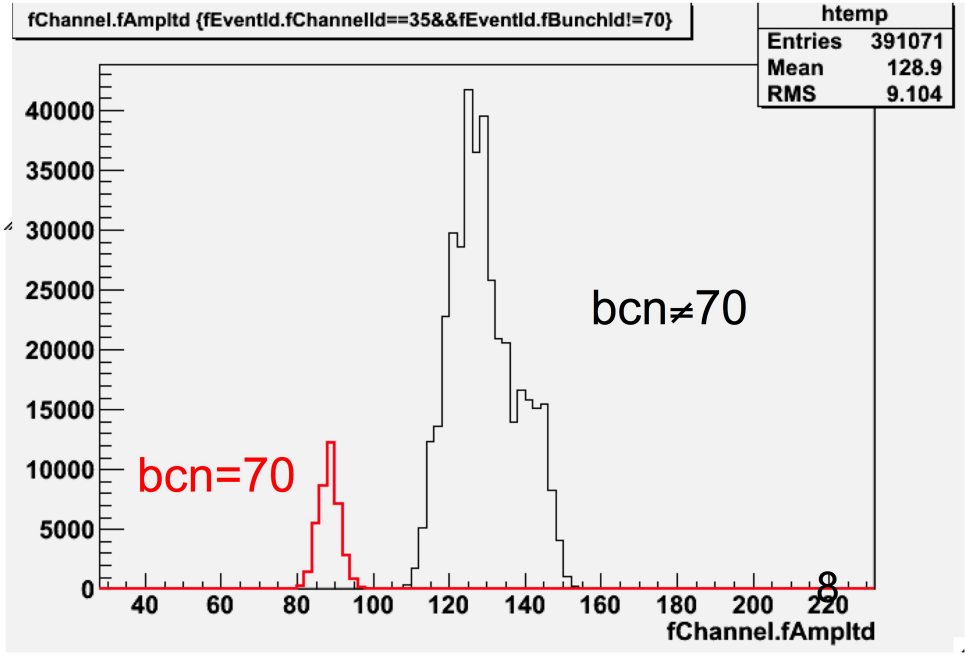
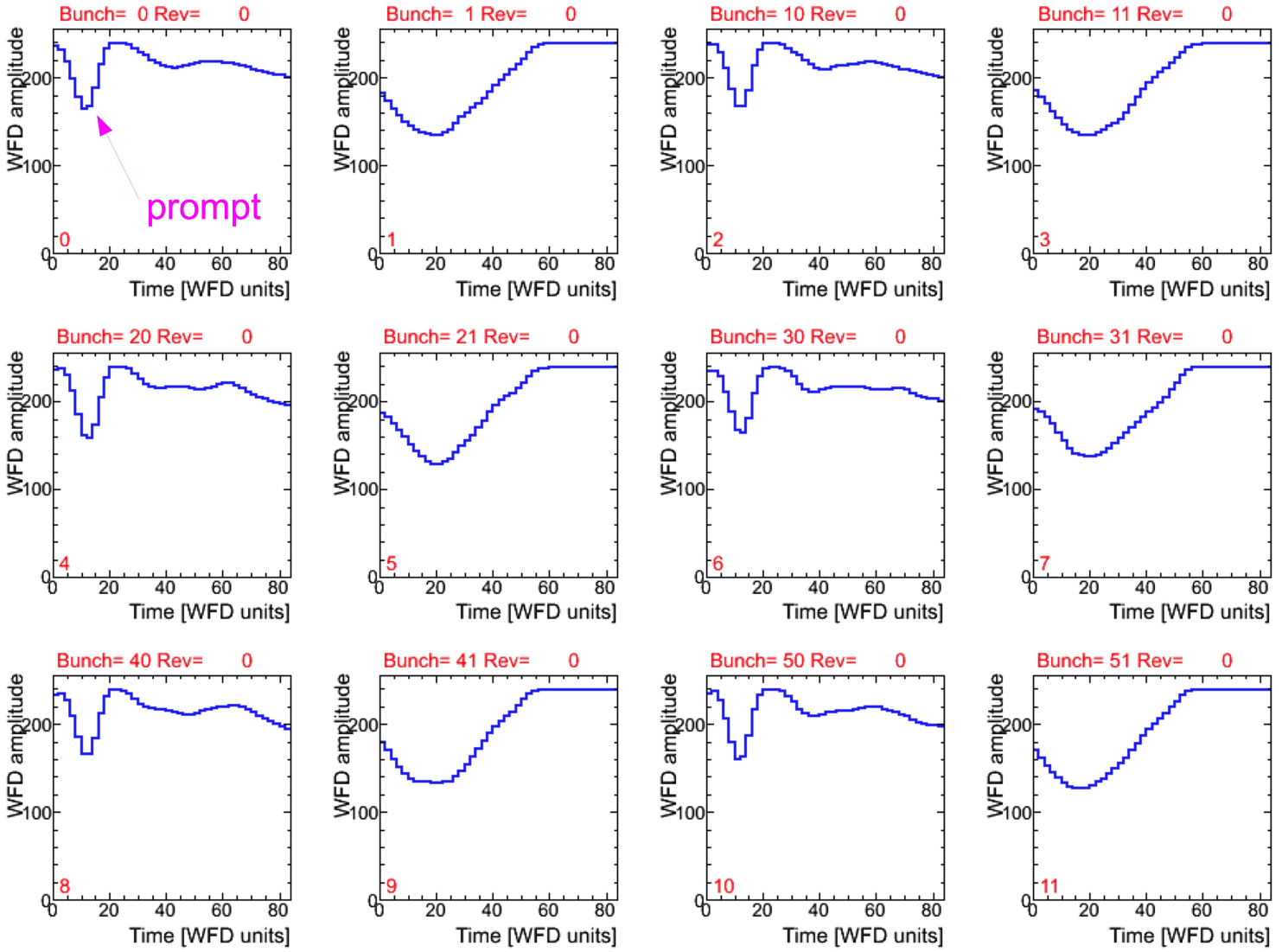


- The 2nd blob on TDC-Amp plot is bcn 70 after long gap:
- Wider pulse: wave peak 75-80 const. frac. discrim. ~55



Waveforms

- Stranger: chan. 2 (det. 1): triggered every filled bunch
- Prompt pulse visible near T=10;
- After-pulse extending to next bunch, also triggered



Data cleaning

- Effects seen in recorded waveforms already seen on scope
- But also: they reflect the nature of recorded data:
  noise pulse are wider (T) than signals (carbon pulses ~ pulser)

WFD reconstructed pulse info:

- Amp = amplitude max. sample
- Tdc = CFD time, resolution 1.2 nS
- Int = integral (sum) of all samples
- TdcAMax = time of max. sample, resolution 2.4 nS

Pulse T-width related to:

- Int/Amp ~ width of pulse
- TdcAMax-Tdc ~ length of pulse rising edge

Should be able to use (Int/Amp), (TdcAMax-Tdc) to identify noise

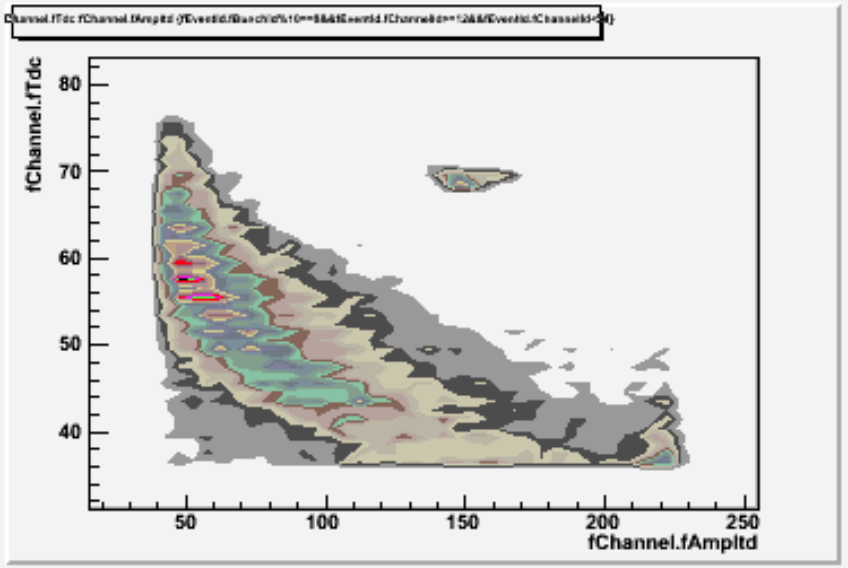
Look at pC sweep data same run 16495.301 ↘

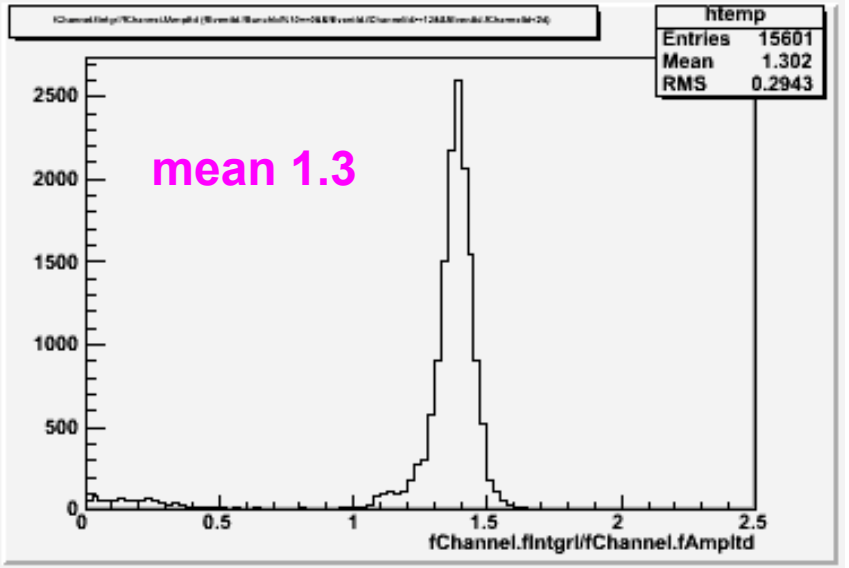
Int/Amp

Tdc vs. Amp

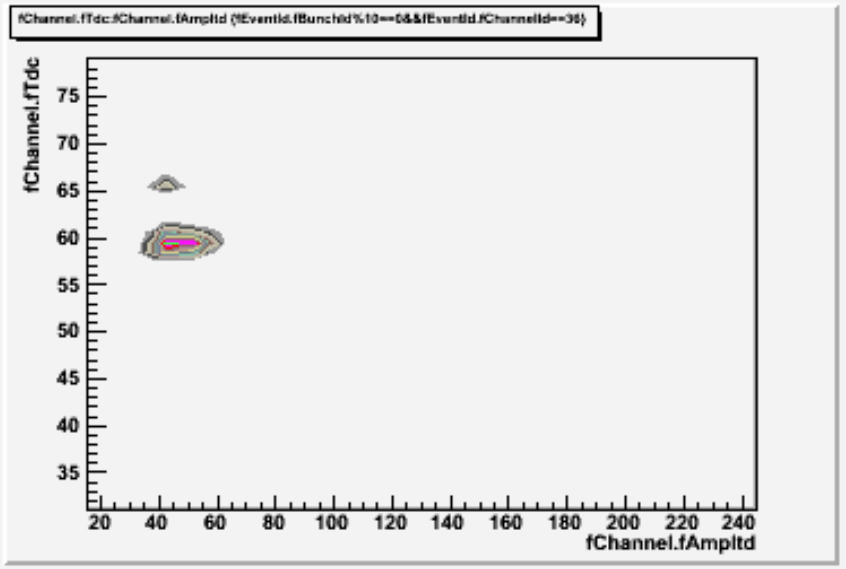
Int/Amp

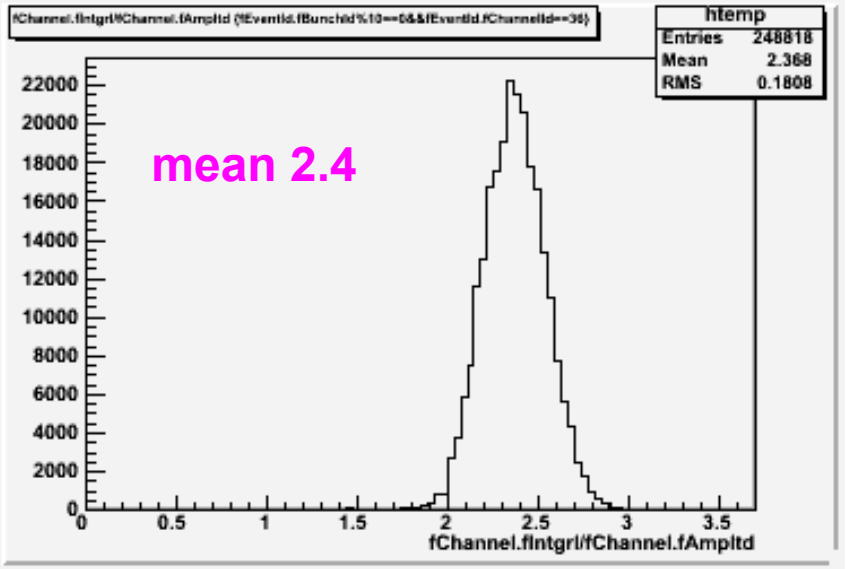
good chans. det. 2





noisy chan. 37





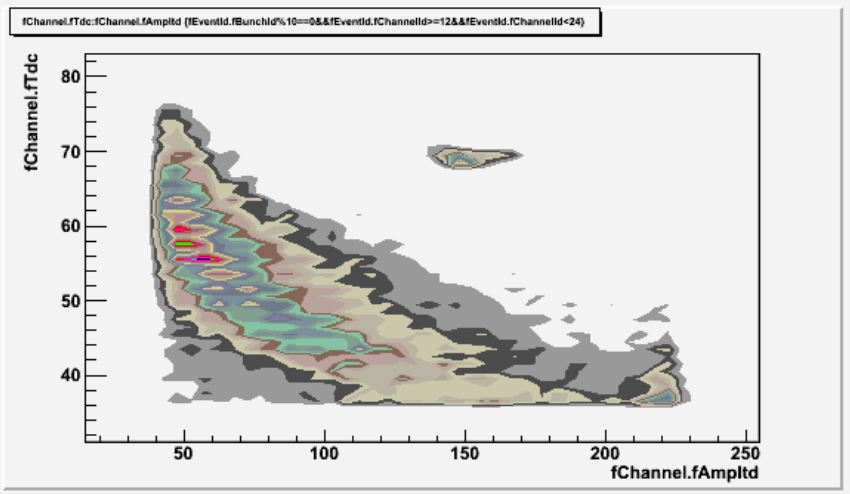
- Noise pulses have larger Int/Amp
- Pretty clean signal/noise separation

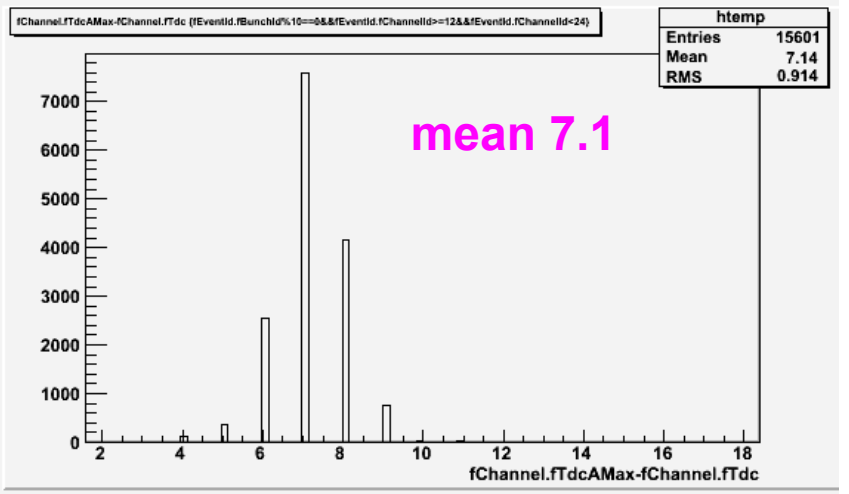
TdcAMax-Tdc

Tdc vs. Amp

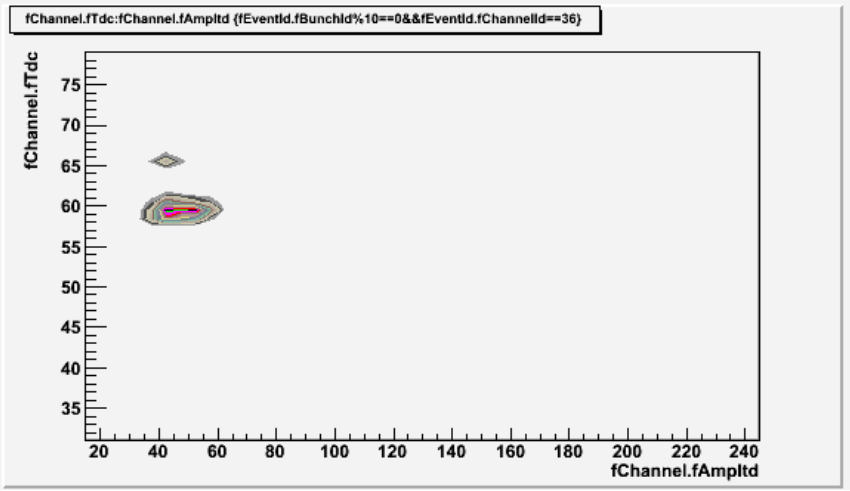
TdcAMax-Tdc

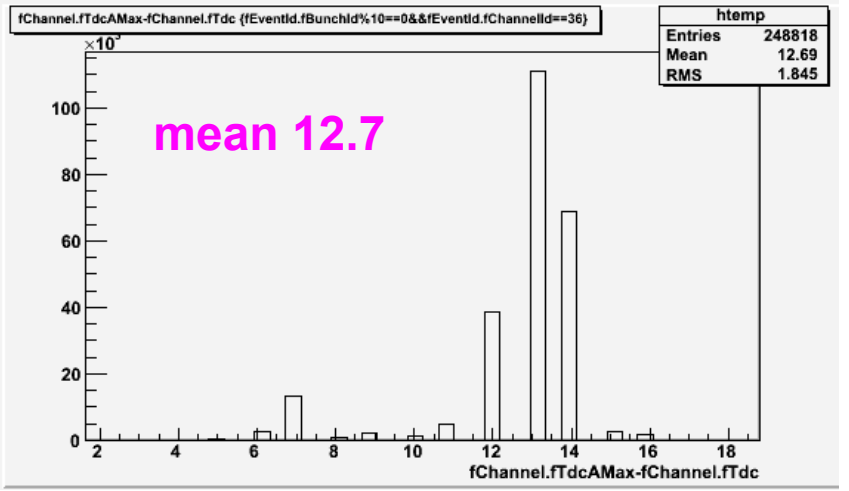
good chans. det. 2





noisy chan. 37





- Noise pulses have larger TdcAMax-Tdc
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Data cleaning

Clearly can use tools like these to clean our data:

- Identify/reject noise events
- Identify/reject noisy channels
- Identify/reject noisy detectors

Already simple versions of channel cleaning are in use
and giving respectable polarization measurements:

- Offline (for over 1 week): cut on topography of Tdc-Amp plane
- Online (since yesterday): reject detectors large variation #events/chan.
  (new online values not archived, sorry Phil...)

- Not the whole story: next need to worry about baseline (basecurve?)
  shifts under good carbon signal ⇒ shifts of E-window for pol. measure
- But we definitely will extract good polarization measurements
  with this data *as is*

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Very important:

- **Need stable running configuration, channels on and read out**
- **Must avoid random ill-motivated perturbations on system**

Extras

Special target data

Data recorded with special targets (from data base)

Highly twisted targets

- B1U H3 – 0 runs
- B1U H6 – 0 runs
- B2D V3 – 40-50 runs Feb. 13-14
- B2D V6 – 0 runs

Short targets

- B1U H5 – 0 runs
- B2D V5 – 0 runs

Wide target

- B2D H4 – 10 runs Feb. 28-29

Very wide target

- B2D H6 – 2 runs March 1

Special targets (nominal dimensions except as noted) and locations are:

- 4 highly twisted targets (B1U H3,H6; B2D V3,V6)
- 3 short targets 20 mm long (B1U H5; B2D V5; Y1D H6)
- 1 wide target 50-75 μ wide (B2D H4)
- 1 very wide target 5 mm wide, fixed angle w.r.t. beam, detectors (B2D H6)

Demise of Y2U det. 4 preamp

20.2 ~11:55

- Last OK run 16449.307; usual 'noise' effect, otherwise normal

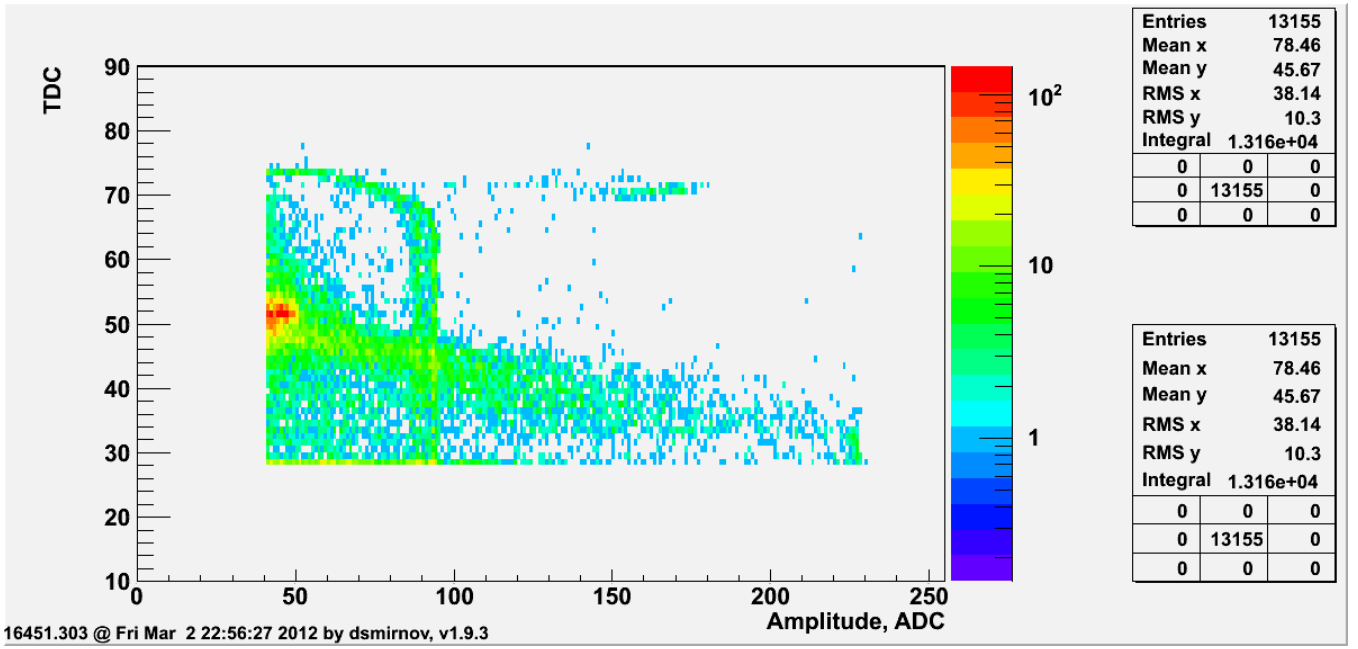
←**nothing notable in e-log here, quick refill**

20.2 ~13:30

- Run 16450.302 start problems, 2 chan. weak or dead or messy
- Continued throughout fill 16450

21.2 ~02:30

- Run 16451.301 start disaster, all chan. ~dead, plot empty
- Run 16451.303 start crazy behavior:



Int/Amp vs. TdcAMax-Tdc

- Contours: good chans. det. 2
- Boxes: noisy chan. 37